



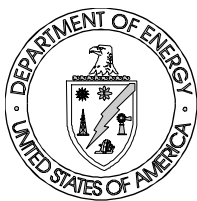
U.S. Department of Energy  
Technical Qualification Program

# ***Radiation Protection Topical Area***

## **Study Guide**

Developed by the  
*Ohio Field Office*  
and  
*Office of Technical Training  
and Professional Development (EH-74)*

**DRAFT**  
**Revision 1**  
**August 1997**



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*Radiation Protection Competencies*

Radiation Protection Competency 1.1 ..... RP 1.1-1

**Radiation protection personnd shall demonstrate a working level knowledge of the various types of radiation and how they interact with matter.**

Radiation Protection Competency 1.2 ..... RP 1.2-1

**Radiation protection personnel shall demonstrate a working level knowledge of radioactivity and transformation mechanisms.**

Radiation Protection Competency 1.3 ..... RP 1.3-1

**Radiation protection personnel shall demonstrate a working level knowledge of principles and concepts for internal and external dosimetry.**

Radiation Protection Competency 1.4 ..... RP 1.4-1

**Radiation protection personnel shall demonstrate a working level knowledge of the biological effects of radiation.**

Radiation Protection Competency 1.5 ..... RP 1.5-1

**Radiation protection personnel shall demonstrate aworking level knowledge of the principles and use of radiological instrumentation and radiological monitoring/survey practices.**



Radiation Protection Competency 1.6 ..... RP 1.6-1

**Radiation protection personnel shall demonstrate a working level knowledge of internal and external radiation protection principles and control techniques.**

Radiation Protection Competency 1.7 ..... RP 1.7-1

**Radiation protection personnel shall demonstrate a working level knowledge of ALARA principles and their application to radiological work activities.**

Radiation Protection Competency 1.8 ..... RP 1.8-1

**Radiation protection personnel shall demonstrate a working level knowledge of the application of engineered radiological controls and facility design, including containment/confinement systems.**

Radiation Protection Competency 1.9 ..... RP 1.9-1

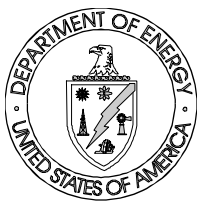
**Radiation protection personnel shall demonstrate a familiarity level knowledge of radiological hazards associated with the following:**

- **Plutonium operations**
- **Uranium operations**
- **Tritium operations**
- **Production/experimental reactors**
- **Accelerator operations**
- **Waste handling/processing operations**
- **Decontamination and decommissioning**
- **Use of Radiation Generating Devices**
- **Environmental restoration activities**

Radiation Protection Competency 2.1 ..... RP 2.1-1

**Radiation protection personnel shall demonstrate an expert level knowledge of the DOE radiation protection systems for occupational workers set forth in the following policy, requirements and guidance documents:**

- **10 CFR 835, *Occupational Radiation Protection***
- **IGs for use of 10 CFR 835**



- DOE P 441.1
- DOE N 441.2

Radiation Protection Competency 2.2 ..... RP 2.2-1

**Radiation protection personnel shall demonstrate a working level knowledge of the following regulations, codes, policy, and DOE Orders, notices and standards related to radiation protection:**

- DOE P 450.2A
- DOE Order 5400.5, or 10 CFR 834 when promulgated
- DOE Order 5480.4
- DOE Order 232.1
- DOE Order 5480.19
- Radiological Control Manual

Radiation Protection Competency 2.8 ..... RP 2.8-1

**Radiation protection personnel shall demonstrate a working level knowledge of national and international radiation protection standards and recommendations.**

Radiation Protection Competency 2.9 ..... RP 2.9-1

**Radiation protection personnel shall demonstrate a familiarity level knowledge of the Federal regulations, guidelines, and Orders pertaining to the decontamination and decommissioning of nuclear facilities.**

Radiation Protection Competency 2.12 ..... RP 2.9-1

**Radiation protection personnel shall demonstrate a familiarity level knowledge of the Department's guidance for the structure, function, and operation of a radiation generating device (RGD) control program as discussed in Implementation Guide G-10 CFR 835/C3-Rev. 2 Radiation Generating Devices.**

Radiation Protection Competency 4.3 ..... RP 4.3-1

**Radiation protection personnel shall demonstrate the ability to trend radiation protection related information/data.**



Radiation Protection Competency 4.4 ..... RP 4.4-1

**Radiation protection personnel shall demonstrate the ability to effectively communicate the hazards associated with exposure to ionizing radiation.**

*Other Related Competencies*

Environmental Compliance Competency 4.4 ..... EC 4.4-1

**Environmental compliance personnel shall demonstrate the ability to appraise the contractors' program(s) to assess compliance with the requirements for environmental radiation protection.**

EH Resident Competency 1.30 ..... EH 1.30-1

**EH Residents shall demonstrate a familiarity level knowledge of Department of Energy radiation protection requirements sufficient to assess the effectiveness of radioactive material containment, exposure control, and radiological work practices.**

EH Resident Competency 1.31 ..... EH 1.31-1

**EH Residents shall demonstrate a familiarity level knowledge of the systems and components for radiation detection, exposure monitoring, and contamination monitoring.**

EH Resident Competency 1.32 ..... EH 1.32-1

**EH Residents shall demonstrate a familiarity level knowledge of "as low as reasonably achievable" (ALARA) principles.**

EH Resident Competency 2.6 ..... EH 2.6-1

**EH Residents shall demonstrate a familiarity level knowledge of the requirements for hazardous and mixed waste management in Department of Energy (DOE) Order 5820.2A, *Radioactive Waste Management*.**

EH Resident Competency 2.9 ..... EH 2.9-1

**EH Residents shall demonstrate a familiarity level knowledge of the requirements for radiation protection in the following regulation and Department of Energy (DOE) Orders:**



- 10 CFR 835, *Occupational Radiation Protection*
- DOE Order 5400.5, *Radiation Protection of the Public and Environment*
- DOE Order 5480.11, *Radiation Protection for Occupational Workers*
- DOE Radiological Control Manual (DOE/EH-0256T, Current Revision)

Emergency Management Competency 1.3 ..... EM 1.3-1

**Emergency management personnel shall demonstrate a working level knowledge of health physics and radiation protection to oversee emergency activities and provide guidance in mitigating emergencies.**

Emergency Management Competency 1.8 ..... EM 1.8-1

**Emergency management personnel shall demonstrate a working level knowledge of decontamination procedures.**

General Technical Base Competency 2.1 ..... GT 2.1-1

**Personnel shall demonstrate knowledge of radiological controls, practices, procedures, and theory.**

General Technical Base Competency 2.2 ..... GT 2.2-1

**Personnel shall demonstrate knowledge of contamination control, practices, procedures, and theory.**

General Technical Base Competency 2.3 ..... GT 2.3-1

**Personnel shall demonstrate knowledge of basic radiation detection methods and principles.**

General Technical Base Competency 2.4 ..... GT 2.4-1

**Personnel shall demonstrate knowledge of the requirements documents for radiological controls, practices, procedures, and limits.**

General Technical Base Competency 2.5 ..... GT 2.5-1

**Using references, personnel shall demonstrate knowledge of the purpose of the following DOE Orders:**

- DOE Order 1540.3A, *Base Technology for Radioactive Material Transportation Packaging Systems*



- DOE Order 5400.5, *Radiation Protection of the Public and the Environment*
- DOE N 5480.6, *Radiological Control Manual*
- DOE Order 5480.11, *Radiation Protection for Occupational Workers*
- DOE Order 5480.15, *Department of Energy Laboratory Accreditation Program for Personnel Dosimetry*

Nuclear Explosives Safety Competency 1.2 ..... NE 1.2-1

**Nuclear explosives safety personnel shall demonstrate a working level knowledge of the radiological, equipment, and personnel hazards associated with nuclear explosives/weapons.**

Nuclear Safety Systems Competency 1.2 ..... NS 1.2-1

**Nuclear safety system personnel shall demonstrate a working level knowledge of the various types of radiation interactions with matter.**

Waste Management Competency 2.1 ..... WM 2.1-1

**Waste management personnel shall demonstrate a working level knowledge of 29 CFR 1910.96, Ionizing Radiation, 29 CFR 1910.97, Non-Ionizing Radiation, and DOE Order 5480.11, Radiation Protection for Occupational Workers.**

Waste Management Competency 2.4 ..... WM 2.4-1

**Waste management personnel shall demonstrate a working level knowledge of DOE Order 5400.5, Radiation Protection of the Public and the Environment.**

Appendix: Glossary ..... A-1



### 1. Scope and Background

This study guide encompasses those competencies addressing radiation protection skills and knowledge identified as the radiation protection topical area. The implementation of this standard fulfills one of DOE's commitments to Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 93-3, *Improving DOE Technical Capability in Defense Nuclear Facilities Programs*. This study guide was produced in support of the lead site concept by the Ohio Field Office and DOE/EH, Office of Technical Training and Professional Development (EH-74).

The study guide maintains the original Radiation Protection Qualification Standard's focus on competency rather than on the illustrative supportive knowledge and skills. The parameters used were:

- If a competency and its supporting skills and knowledge seemed to be in conflict, the developer considered the competency over the supporting skills and knowledge.
- The competencies identify a familiarity level, working level, or expert level of knowledge; or they require the individual to demonstrate the ability to perform a task or activity. The exercises, test questions, and learning activities were written for the competency in accordance with these definitions. These levels are defined as follows:

**Familiarity level** is defined as basic knowledge of or exposure to the subject or process adequate to discuss the subject or process with individuals of greater knowledge.

**Working level** is defined as the knowledge required to monitor and assess operation/activities, to apply standards of acceptable performance, and to reference appropriate materials and/or expert advice as required to ensure the safety of Departmental activities.

**Expert level** is defined as a comprehensive, intensive knowledge of the subject or process sufficient to provide advice in the absence of procedural guidance.

**Demonstrate the ability** is defined as the actual performance of a task or activity in accordance with policy, procedures, guidelines, and/or accepted industry or Departmental practices.

Many technical training courses and materials have been developed for the Department. To define the scope for resources for this effort, the following parameters were used:

- Availability--most technical training personnel could easily acquire the references and would be familiar with them
- Decision hierarchy for selecting references:
  1. Cited in the competency
  2. DOE product
  3. Readily available
  4. Content written in textbook format, with examples, exercises, checklists, etc. that could be





cited in the study guide

- Less is better--the fewer resources a job incumbent must locate and read the better. There is no reason to cite obscure documents when others are readily available and serve the same purpose, to relate to the competency.

## 2. Purpose

The purpose of this study guide is twofold:

- To identify the training content and associated self-study activities that will promote the learning of the skills and knowledge associated with the radiation protection competencies.
- To provide a matrix of existing comparable and applicable learning activities (such as training or education courses) and materials, which can then be used to satisfy the competency requirements.

## 3. How to Use This Study Guide

- a. Read this guide and complete the associated learning activities for those competencies you wish to satisfy through self-study. As you need to, refer to the glossary located in Appendix A, which contains the standard definitions.
  - b. For assistance or additional information, contact your supervisor or subject matter experts at your facility or site, or refer to identified resources in the Suggested Additional Readings and/or Courses at the end of each competency and in the Reference Matrix, located in Appendix B.
- \* **This study guide, by itself, does not satisfy a competency. Rather it is intended, as its name implies, as a study guide only. The scenarios, activities, etc. and the accompanying answers are the professional opinion of subject matter experts (SMEs) and do not necessarily reflect DOE's current policy.**

## 4. DOE Orders in Transition

DOE Orders are in a state of transition. However, Order cancellation does not necessarily mean that the Order is no longer applicable to a site. For example, DOE N 441.1, *Radiological Protection for Doe Activities*, which cancels three radiation protection-related Orders, states:

"Cancellation of an Order does not, by itself, modify or otherwise affect any contractual obligation to comply with such an Order. Canceled Orders that are incorporated by reference in a contract shall remain in effect until the contract is modified to delete the reference to the requirements in the canceled Orders."

This study guide refers to both the old and new Orders. There are three reasons for this: (1) as



stated above, many facilities are contractually obligated to follow the old Orders, (2) the replacement process is dynamic and will continue for some time, and (3) the old Orders are often content-oriented and house the in-depth details regarding processes and procedures.

Rather than publish a matrix of new and old Orders within this study guide, participants should refer to the document, *Crosswalk of Old Directives Numbers to New Directives Numbering System*. This is an excellent resource. It is linked to the DOE homepage (<http://apollo.osti.gov/>) "Clearinghouse for Training, Education and Development" (<http://cted.inel.gov/cted/>) or may be reached directly at the following site:

<http://www.explorer.doe.gov:1776/htmls/alldirectives.html>

**NOTE:** The study guides were developed to provide a timely route for incumbents to utilize existing materials. It is anticipated that they will be supplemented and/or replaced by other courses and more detailed materials as they are located or developed.

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